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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **Method of producing electroacoustic converters, preferably microphones, and converters produced according to the method.**

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Description

Technical field

The invention relates to a method of producing electroacoustic converters with closed resonance chambers, preferably microphones, and converters produced according to the method, each including a frame surrounding said resonance chamber and a diaphragm closing off the resonance chamber, as well as means for electrical connection.

Background art

In electroacoustic converters with good base reproduction, the resonance chamber between the diaphragm and the rear side of the converter must be closed. Such known converters (e.g. WO—A1—83/01362) have a fixed rear side, and the volume of this resonance chamber cannot be changed to adjust the sensitivity of the microphone. It has been proposed to provide such converters, e.g. microphones, with a movable piston so that adjustment can be made. This, however, results in the creation of large leaks in the resonance chamber, and this deleteriously affects the base reproduction of the microphone. There are also problems with the item-by-item handling of the microphones during production.

Disclosure of the invention

The basic idea of the invention is to attach electroacoustic converters to a common band or strip, which forms a sealed-off and deformable rear side, enabling continuous manufacture.

The invention is characterized by the disclosures in the appended claims.

Brief description of drawings

One embodiment of the invention will now be described in connection with a drawing, where Figure 1 is a perspective, exploded view of a microphone with a closed resonance chamber, Figure 2 is a cross section through a microphone, the Figure also depicting a means for measuring and adjusting its sensitivity, and Figure 3 illustrates microphones attached to a band.

Best mode for carrying out the invention

Figure 1 illustrates an electret microphone in which a frame 1 conventionally carries an electrode 2 and a microphone diaphragm 3. The latter is an electret film having a metallic coating on its upper side. At its short ends, the electrode rests in depressions 4 in the frame and is fixed in position by the diaphragm 3 being stretched over ridges 2a on the electrode. The diaphragm is retained by a fork-shaped electrical connecting member 5, only a part of which is shown. The diaphragm is kept pressed into grooves 6a on the upper side of the frame by the connection member, which is in turn kept in a downwardly pressed position by a cover 7, the under side of which has grooves 6b (see Figure 2) corresponding to the grooves 6a. The cover is attached to the frame by projections 8, which engage in holes 9 in the cover. The connection member 5 is of metal and has a coating 5a of electrically conductive silicone rubber, partly to keep the diaphragm located in the grooves by force of elasticity, and partly to constitute electrical connection to the diaphragm. Via a spot, accessible through a hole 7a in the cover, the connection member 5 is electrically connected to an outer connection tab 10, which is connected in turn by a pin 11a to an integrated amplifier 11. By a projection 12 the electrode 2 is in contact with a connection pin 11b on the amplifier, which has a further pin 11c in contact with an exterior connection tab 13.

In accordance with the invention the frame 1 of the microphone has on its underside a wafer 14 of plastically deformable material. The wafer is sealingly attached to the frame by a weld 15 running round the frame and illustrated in Figure 2, it also being indicated in Figure 1 by a dashed line on the wafer. The resonance chamber between the wafer 14 and diaphragm 3 will thus be closed, which gives the microphone good base reproduction. The sensitivity of the microphone, i.e. the relationship between the received sound strength and electric signals sent, is dependent on the volume of the resonance chamber. The volume of the resonance chamber can be changed to obtain the desired sensitivity by deforming the wafer with a depression 16.

The microphones described above are produced by a method according to the invention in the following way. At an operation station the frames are placed at given spacing, suitably along the edge of a band 17 of the thermoplastic resin, as illustrated in Figure 3. The frames are then welded to the band so that the joint 15 described in conjunction with Figure 2 is obtained. The frames are then conveyed with the aid of the band 17 to a series of operation stations where the following operations are performed:

The electrode 2, amplifier 11 and connection tabs 10 and 13, which are connected to each other by welding as described above, are placed in the frame. The diaphragm is stretched over the electrode and fixed into position by being pressed into the grooves 6a in the frame by the connection member 5 with the aid of the cover 7. This is fastened down by the projections 8 engaging in the holes 9 being riveted over at increased temperature on the upper side of the cover. The diaphragm 3 is connected electrically to the connection tab 10 by the connection member 5 and the tab 10 being welded together at a spot accessible through the hole 7a in the cover. The microphone is connected to measuring apparatus 20, indicated in Figure 2, and its output signal measured and compared with a reference signal from a loudspeaker 18 supplying sound to the microphone. The sensitivity of the microphone thus measured is adjusted by pressing a tool 19 at a raised temperature against the band 17 within the frame 1 so that the depression 16 is formed. The volume of the resonance chamber is thus reduced until desired sensitivity is obtained, further depression by the tool then being stopped.

After the sensitivity of the microphones has been adjusted, they are released from the band by the latter being cut along the edge of the frame. The microphones are then encapsulated conventionally in a protective capsule and their sensitivity checked by a new measurement.

Claims

1. A method of producing electroacoustic converters with closed resonance chambers, preferably microphones, each including a frame (1) surrounding said resonance chamber and a diaphragm (3) closing it off, as well as means for electrical connection (10, 11a, 11b, 11c, 13), characterized in that the frames (1) are placed with their undersides against a band or strip (17) of plastically deformable material, in that the underside of the frames is sealingly attached to the band along the entire periphery of the frame, in that the connection means (10, 11a, 11b, 11c, 13) are mounted and the diaphragm (3) is attached to the upper side of the frame (1) so that the resonance chamber formed between the band (17) and diaphragm (3) will be closed off to give the converter good base reproduction, in that the sensitivity of the converter is measured (20), in that the sensitivity is adjusted (19) to the desired value by the band being deformed (16) within the frame for changing the volume of resonance chamber and in that the converter is released from the band (17) by the latter being cut along the contour of the frame.

2. An electroacoustic converter produced according to the method in claim 1, with a closed resonance chamber, preferably a microphone, including a frame (1) surrounding said resonance chamber and a diaphragm (3) closing off the resonance chamber, as well as means for electrical connection, (10, 11a, 11b, 11c, 13), characterized in that the frame (1) has on its underside a wafer (14) of plastically deformable material which is attached to the frame (1) by a sealing joint (15) along its entire periphery so that the resonance chamber between the diaphragm (3) fastened at the upper side of the frame and the wafer (14) is closed off for giving the converter good base reproduction, and in that the sensitivity of the converter is adjusted (16, 19) to the desired value by changing the volume of the resonance chamber by plastically deforming the wafer (14).

Patentansprüche

1. Verfahren zur Herstellung von elektro-akustischen Wandlern mit geschlossenen Resonanzkammern, vorzugsweise Mikrofonen, von denen jeder einen die Resonanzkammer umgebenden Rahmen (1) und eine diese abschließende Membran (3) wie auch Mittel zur elektrischen Verbindung (10, 11a, 11b, 11c, 13) enthält, dadurch gekennzeichnet, daß die Rahmen (1) mit ihren Unterseiten gegen ein Band oder einen Streifen (17) aus plastisch verformbarem Material angeordnet werden, daß die Unterseite der Rahmen entlang des gesamten Umfangs des Rahmens dichtend an dem Band angebracht wird, daß an der Oberseite des Rahmens (1) die Verbindungsmittel (10, 11a, 11b, 11c, 13) befestigt und die Membran (3) derart angebracht werden, daß die zwischen dem Band (17) und der Membran (3) gebildete Resonanzkammer abgeschlossen ist, um dem Wandler eine gute Grundreproduktion zu geben, daß die Empfindlichkeit des Wandlers gemessen wird (20), daß die Empfindlichkeit auf den gewünschten Wert durch Verformen (16) des Bandes in dem Rahmen zum Ändern des Volumens der Resonanzkammer adjustiert wird (19), und daß der Wandler von dem Band (17) durch Schneiden des letzteren entlang dem Umriß ds Rahmens gelöst wird.

2. Elektro-akustischer Wandler, hergestellt nach dem Verfahren gemäß Anspruch 1, mit einer geschlossenen Resonanzkammer, vorzugsweise Mikrofon, enthaltend einen die Resonanzkammer umgebenden Rahmen (1) und eine die Resonanzkammer abschließende Membran (3), wie auch Mittel zur elektrischen Verbindung (10, 11a, 11b, 11c, 13), dadurch gekennzeichnet, daß der Rahmen (1) auf seiner Unterseite ein Plättchen (14) aus plastisch verformbarem Material aufweist, welches an dem Rahmen (1) entlang dessen gesamten Umfangs durch eine Dichtverbindung (15) angebracht ist, so daß die Resonanzkammer zwischen der an der Oberseite des Rahmens befestigten Membran (3) und dem Plättchen (14) abgeschlossen ist, um dem Wandler eine gute Grundreproduktion zu geben, und daß die Empfindlichkeit des Wandlers auf den gewünschten Wert durch Ändern des Volumens der Resonanzkammer durch plastisches Verformen des Plättchens (14) adjustiert ist (16, 19).

Revendications

1. Procédé de fabrication de converteurs électroacoustiques avec chambres de résonnance fermées, de préférence des microphones, chacun comprenant un cadre (1) entourant ladite chambre de résonnance et un diaphragme (3) la fermant, ainsi que des moyens pour le branchement électrique (10, 11a, 11b, 11c, 13), caractérisé en ce que les cadres (1) sont disposés avec leurs côtés inférieurs sur une bande ou un ruban (17) de matière plastique déformable, en ce que le côté inférieur des cadres est étanchement attaché à la bande lelong de l'entière périphérie du cadre, en ce que les moyens de contact (10, 11a, 11b, 11c, 13) sont montés et le diaphragme (3) est relié au côté supérieur du cadre (1) de sorte à ce que la chambre de résonnance formée entre la bande (17) et le diaphragme (3) est fermée afin d'assurer au converteur une bonne résonnance de base, en ce que la sensibilité du converteur est mesurée (20), en ce que la sensibilité est ajustée (19) à la valeur désirée par déformation (16) vers l'intérieur du cadre de la bande afin de modifier le volume de la chambre de résonnance et en ce que le converteur est séparé de la bande (17) par le fait

que la dernière est coupée lelong du pourtour du cadre.

2. Converteur électroacoustique fabriqué selon le procédé de la revendication 1, avec une chambre de résonnance fermée, de préférence un microphone, comprenant un cadre (1) entourant ladite chambre de résonnance et un diaphragme (3) fermant la chambre de résonnance, ainsi que des moyens pour le branchemant électrique (10, 11a, 11b, 11c, 13), caractérisé en ce que le cadre (1) présente sur son côté inférieur une paroi (14) en matière plastique déformable attachée au cadre (1) par un joint d'étanchéisation (15) lelong l'ensemble de sa périphérie, de sorte à ce que la chambre de résonnance entre le diaphragme (3) fixé au côté supérieur du cadre et la paroi est fermée, afin d'assurer au converteur une bonne reproduction de base, et en ce que la sensibilité du converteur est ajustée (16, 19) à la valeur désirée par une modification du volume de la chambre de résonnance effectuée par une déformation plastique de la paroi (14).

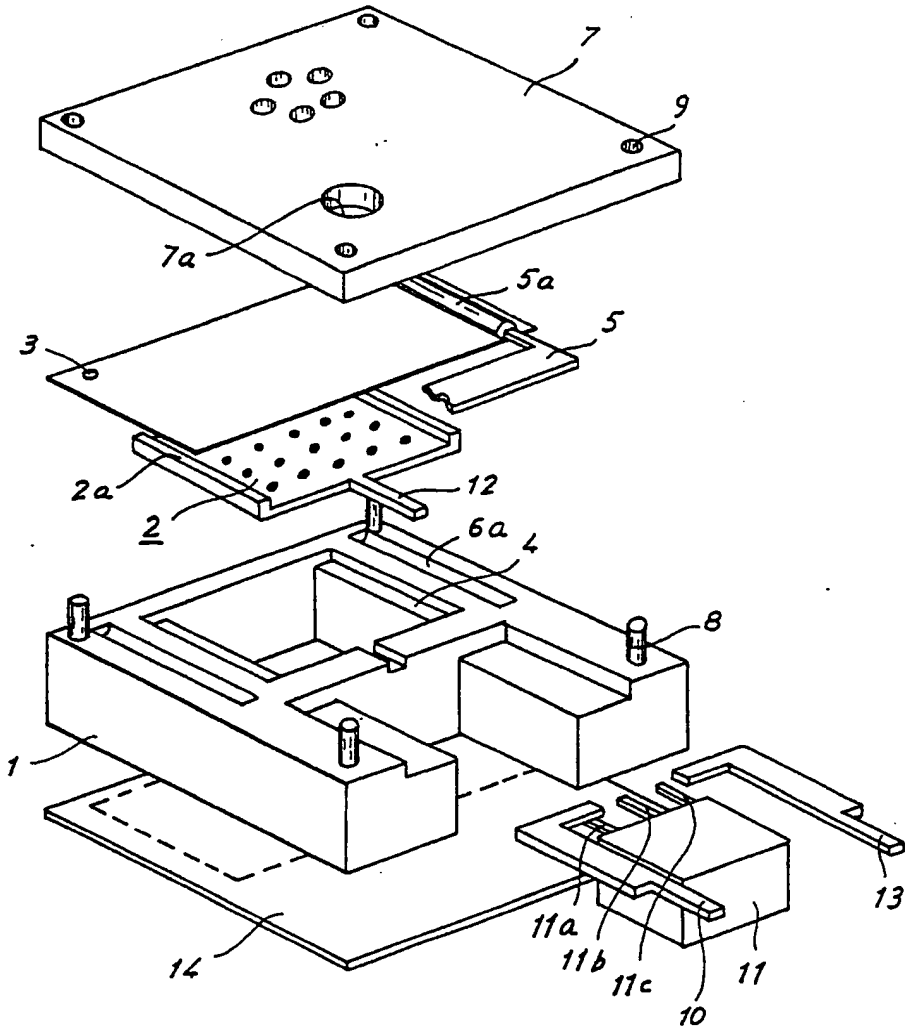

FIG. 1

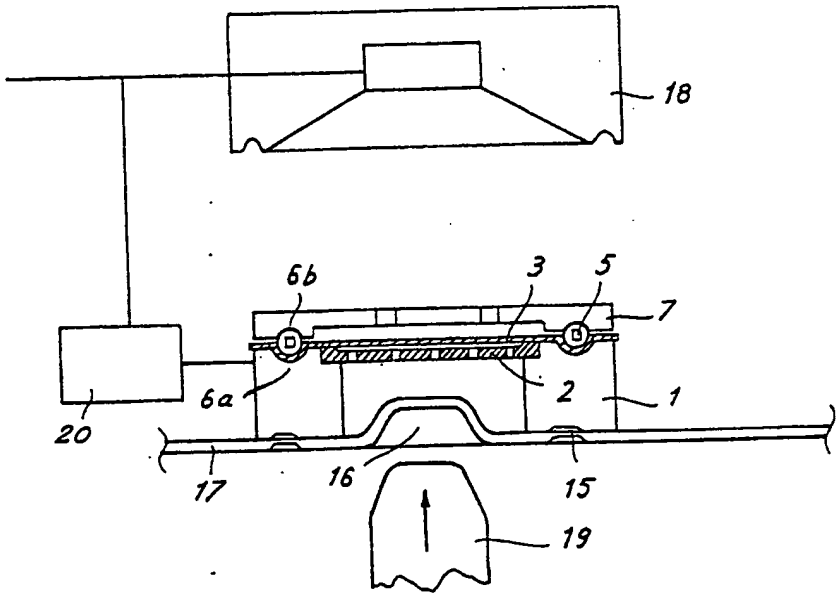

FIG. 2

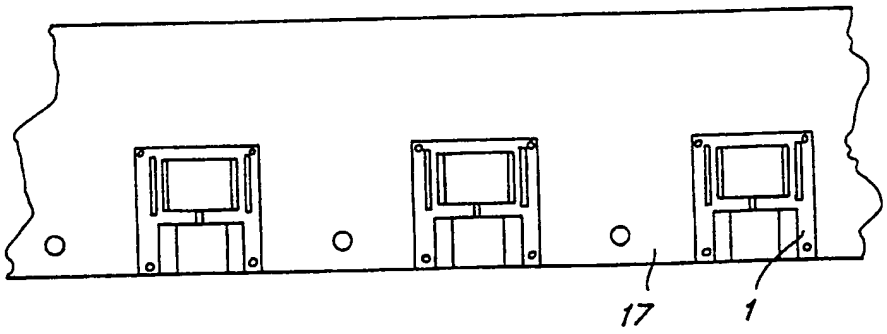

FIG. 3